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Affordability And Willingness To Pay Of Water Users In Kathmandu Valley

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INTRODUCTION

Provision and management of safe and waste water have a central role in reducing the incidence of waterborne communicable diseases which are among the most serious health problems, and whose consequences are widespread in developing countries like Nepal. Realising this fact, His Majesty's Government of Nepal (HMG/N) has been according higher priority for the provision of drinking water. Nepal was a signatory to the UN resolution on the International Drinking Water Supply and Sanitation Decade (1981-90) which called for acceleration of plans and programmes in the drinking water supply and sanitation sector. In spite of emphasis of the HMG/N on the provision of safe water, the coverage was about 61 percent of the total population by the end of the Eight Five Year Plan and the level of service was also poor. The Eight Five Year Plan (1992-97) of Nepal recognised that the shortfall arised less from inadequate investment than from deficiency in sector institutions.

The past policy in the water and sanitation sector has promoted inequities, as the benefits from provision of subsidised water has been enjoyed mainly by the rich people and people living in the richer areas. In case of Nepal, cross-subsidy in Nepal Water Supply Corporation (NWSC) service area is from outside the Kathmandu valley to inside the valley on the average, whereas Kathmandu valley incomes are higher than incomes elsewhere. Moreover, another element of inequitable cross-subsidy occurs in Kathmandu where a few customers with 24 hours supply pay the same rates as many more customers with uncertain, intermittent and sometimes no supplies. In Nepal, subsidies probably flow from poor to rich, since a large fraction of urban water supply costs are borne by the general tax payers, while benefits accrue to the urban population, and within urban population, disproportionately to the best off residents who have household connections (World Bank 1993).

To ensure efficient, responsive delivery of infrastructure services, the World Development Report 1994 contends that incentives need to be changed through the application of the following three instruments:

- Commercial management, to facilitate financial autonomy, enhance accountability, and encourage a well-defined set of objectives;

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- Competition, to provide users with more choices, and to compel providers to become more eficient and accountable; and
- A policy to seek the involvement of users and other stakeholder in the design, operation and maintenance of infrastructure, all of which lead to an improved performance in meeting consumer demand.

A new view was endorsed at the International Conference on Water and the Environment held in Dublin in 1992 that treats water as an economic good and calls for a participatory approach to the management of this resource. It is a view that entrusts consumers and neighbourhoods with a large say regrading the services they want and how to pay for them and, as a result, gives the users more choice, as well as responsibility, than the old top-down approach (World Bank 1995)

With the change in the policy approach in the drinking water and sanitation sector, the HMG/N has also been emphasising users' involvement as well as private sector involvement since the inception of the Eight Five Year Plan in the country.

EXISTING DRINKING WATER SYSTEM IN KATHMANDU VALLEY

Service Areas of Nepal Water Supply Corporation (NWSC) in Kathmandu Valley

NWSC is entrusted with the responsibility of supplying drinking water and sewerage services not only to the municipal areas of Kathmandu valley but also to rural areas adjacent to the municipalities and some areas along the transmission mains.

The Kathmandu metropolis is divided into 35 wards, Lalitpur sub-metropolis into 22 wards and Bhaktapur municipality into 17 wards. Due to the ever increasing number of consumers, in 1988 NWSC divided its service areas into zones (Branch Offices) with the aim of achieving manageable operation and maintenance. The total number of such zones is eight: six zones in Kathmandu municipality, and one zone in each Lalitpur municipality and Bhaktapur municipality. Although the zoning defines clear physical boundaries of the service area, the distribution network as well as source for each zone is not clearly defined.

The proportion of ground water in the total supply of water to the Kathmandu valley is increasing because of the non-availability of surface sources. The ground water which contains iron (up to 6 mg/1) and ammonia, causes iron flocculation when mixed with treated surface water leading to lot of operational problems. The supply problems have been rendered more complicated due to the higher leakage in the system. This has led NWSC to prepare long term plan directed towards improvement in physical water supply, leakage control, internal management and revenue administration. The Urban Water Supply and Sanitation Rehabilitation Project (UWSSRP) under implementation, is a part of the improvement process. A study carried out jointly by the CES, SILT and MULTI for the

aforesaid project has made the following observations among others regarding the water supply and sanitation situation in Kathmandu valley (SILT and DRTC 1997):

- With the shortage of NWSC water supply, many households are using private sources;
- There is a practice of removing meters to avoid the obstruction of water through meters;
- Meters are not installed sometimes due to shortage of meter with the NWSC;
- The supply is intermittent and water is distributed by managing the valves;
- The data base of consumers is maintained in manually operated consumers' ledgers.

Water Sources and Systems in Kathmandu Valley

NWSC collects water from 17 spring sources located in the hills surrounding the valley. There are 35 deep tube wells out of which only 15 tube wells are under operation now, and an additional four can be put into operation with some maintenance. Kathmandu valley is being served by seven systems which are fed both by surface and ground water. Altogether, these systems are providing about 105 mld of water during the rainy season (July - September), and 70 mld in the dry season (March-June). It is estimated that 67 percent of the population of the greater Kathmandu is being served by NWSC. The Management Information System report for the month of December 1996 has shown that all the systems together produced 101.63 mld of water in that month (SILT and DRTC 1997).

Nepal Water Supply Corporation Consumers

The recent Consumer Survey enumerated 127,938 houses, out of which, the consumer status of 9,556 houses, 7.5 percent, could not be determined by the Survey because the consumers either declined to provide information or could not be contacted. Therefore, information had been gathered only from 118,382 houses, of which 76,043 houses, 64.2 percent, were NWSC consumers with 78,546 connections, implying that some houses had additional connections of 2,503. Out of the 78,546 connections, 53,963, 68.7 percent, were metered connections, 16,744, 21.3 percent, non-metered connections, and the status of 7,839 connections, 10.0 percent could not be determined. But NWSC record showed a total of 97, 711 connections with 76,050 metered connections, 77.8, 20,386 non-metered connections, 20.9 percent and 1,275 stand post connections, 1.3 percent, during July-August 1997 (SILT and DRTC 1997; Binnie Thames Water 1998).

Out of 78,546 connections enumerated by Consumer Survey, 10,184, 13.0 percent, were in rural areas. Of the 68,362 connections in the urban areas of the valley, 32.8 percent were fully plumbed, 62.2 percent were yard taps and the status of about 5 percent connections could not be determined.

Table 1
Number And Type Of NWSC Consumers In Kathmandu Valley

Particulars	Municipality		Rural		Total	
Consumers	No.	Percent	No.	Percent	No.	Percent
Domestic	62782	95.25	9860	97.33	72642	95.53
Institutional	1383	2.10	138	1.36	1521	2.00
Govt/Semi-govt/Corp.	576	0.87	39	0.38	615	0.81
Education/Health/Religious	621	0.94	95	0.94	716	0.94
Others	186	0.28	4	0.04	190	0.25
Industrial	484	0.73	100	0.99	584	0.77
Commercial	1264	1,92	32	0.32	1296	1.70
Total	65913	100.00	10130	100.00	76043	100.00

Source: SILT and DRTC (1997).

Four kinds of NWSC consumers were identified by the Consumer Survey: i) domestic, ii) institutional, iii) industrial and iv) commercial. The largest group comprises the domestic consumers, 95.5 percent followed by institutional, 2.0 percent, commercial, 1.7 percent and industrial, 0.8 percent consumers. The detail breakdown of number and type of consumers by urban/rural status is given in Table 2. Of total NWSC consumers, the proportion of urban consumers ranges from 94.9 percent in Kathmandu to 96.7 percent in Bhaktapur.

Water Supply

According to Nepal Living Standard Survey (NLSS) 1996, nearly 33 percent of the households of the country have access to piped water but only eight percent have private connections. Compared with rural areas, a larger proportion of households in urban areas are connected to piped water.

In the urban areas of Kathmandu valley, about 93 percent of the households have access to piped water supply and nearly 80 percent have private connections. However, access to piped water supply differs across the three towns of the Kathmandu valley, better in Bhaktapur and poor in Kathmandu. But in Bhaktapur, the proportion of households with private connections is lowest of the three towns of the Kathmandu valley (Table 2).

Table 2
Distribution of Households By Sources Of Drinking Water In Three Municipalities Of Kathmandu Valley

(Percent)

Municipalities	Piped to House	Pipe Outside House	Covered Well	Open Well	Other	Total
Kathmandu	79.96	12.43	4.95	0.34	2.32	100.00
Lalitpur	83.37	9.97	2.28	1.14	3.34	100.00
Bhaktapur	59.83	37.11	0.00	3.07	0.00	100.00
Urban Kathmandu Vally	79.07	13.81	4.09	0.69	2.34	100.00

Source : HMGN, NPC, CBS (1997).

Current Water Tariff of Nepal Water Supply Corporation for Kathmandu Valley

Generaly, water tariff embraces three components: i) user fee, ii) connection fee, and iii) develpment charge. Theoretically, the user fee or consumption charge is supposed to be decided based on the average incremental cost (AIC). Thus, it should be such that it covers the operation and maintenance cost of the system. Similarly, the connection charge should recover the marginal capital cost (MCC) of connection including meter reading, billing, etc. It seems that these two types of charges constitute the water tariff of NWSC in Kathmandu valey. But as they are not set equal to AIC or MCC there is a need for revising these charges. Besides, a development charge should be applied to cover the distribution system.

The provision of basic allowance, free water from standpipes, rising block rates, half inch connections, differential price for residential and non-residential consumers are some of the main features of the current NWSC tariff structure which suggest that it has adopted the principle of discriminatory pricing. The current tariff of NWSC takes into account the size of connection, presence or absence of meter, the nature of connection, main or branch and volume of water consumption if metered.

NWSC has fixed water tariff separately for the metering and non-metering systems. It has classified water users in three categories: i) domestic/residential, ii) government, semigovernment and corporation, and iii) industrial and commercial, and fixed diferent water charges for these three types of users. Under metering system, the water tariff for the three types of users by basic allowance and connection size is given in Tabel 3.

Table 3
Current Monthly Water Tariff For Metered Connections By Size of Connection Pipe And Types Of Users

Connection Size (Inch)	Basic Allowance (M3)	Minimum Water Tariff By Types Of Users (NRs)			Additional Water Tariff Beyond Basic Allowance By Types Of Users Per M3 (NRs)		
		Domestic	Govt/Semi Govt/Corp	Industrial/ Commercial	Domestic	Govt/Semi Govt/Corp	Industrial/ Commercial
0.5	8	24.25	26.65	28.95	6.10-9.95	6.70-10.95	8.15-13.15
0.75	27	441.00	485.10	441.00	15.36	17.50	19.85
1	50	771.75	848.95	771.75	16.35	17.95	20.30
1.5	140	2160.96	2377.00	2160.90	16.65	18.35	20.85
2	235	3627.25	3989.95	3627.25	17.05	18.80	21.35
3	700	10804.50	11884.95	10804.50	17.55	19.25	21.95
4	1400	21609.00	23769.90	21609.00	17.95	19.80	22.45

Note : NRs 10 = US$ 0.15 (December, 1998).
Source: Nepal Water Supply Corporation.

The basic allowance is different for different size of pipes, and the minimum charge is also diferent for the three types of users. The NWSC has cut down the basic allowance from 10 M3 to 8 M3 for half inch connection pipe. Minimum water tariff for the basic allowance of half inch pipe ranges from NRs 24.25 for domestic users to NRs 28.95 for industrial and commercial users. Similarly, the additional tariff beyond the basic allowance is lowest for domestic users and highest for industrial and commercial users. Of particular note is that the additional tariff for half inch connection pipe is variable, rising with increasing block of consumption, whereas it is fixed for the other sizes of the connection pipes. In particular, the additional water tariff per M3 ranges from NRs 6.10 to 9.95 for domestic users, and it ranges from NRs 8.15 to 13.15 for industrial and commercial users. This signifies that NWSC intends to economise the use of water by fixing increasing block rates for the half inch connection pipe whose proportion is largest, 97 percent in the total connections. Most of the residential connections are half inch connections.

If the price elasticity of demand for water service is zero or negligible, the efficiency of resource allocation is not affected by the service charge. In respect of developing countries, it is held that the demand for water consumption is moderately price elastic, which mainly hold for high income groups rather than low income groups. In contrast, the demand for water connection and access opportunities are likely to be more elastic among lower income households, and less elastic for higher income households (Bahl and Linn 1992). There is dearth of literature focusing on this aspect in Nepal, and therefore poses a difficulty in designing water tariff which could help in achieving the sustainable development of drinking water in the country.

For non-metered connection, there is a separate tariff for each of the three types of consumers as mentioned above. As to the half inch non-metered connections for the domestic users, the flat rate is NRs 132. 30 if the connection is from the main pipe, and NRs 44.10 if from any branch connections. It is higher for the other types of users. The highest rate is for the industrial and commercial users which is NRs 220.50 for main pipe connection and NRs 77.20 for branch connections. As compared to the flat tariff rate on main connections for domestic users, tariff rate on such connections for government, semi-government and public corporation is 13.2 percent higher, and that for industrial and commercial users is 66.7 percent higher. Similarly, for branch connection the tariff for government, semi-government and public corporation is 10 percent higher, whereas it is 75 percent higher for industrial and commercial users.

Table 4
Current Monthly Water Tariff For Non-Metered Connections By Size Of Connection Pipe And Types Of Users

Connection Size (Inch)	Domestic Users		Govt, Semi-Govt Organisations and Corporations		Industrial and Commercial Users	
	Main Connecti-on (NRs)	Branch Connecti-on (NRs)	Main Connection (NRs)	Branch Connecti-on (NRs)	Main Connecti-on (NRs)	Branch Connecti-on (NRs)
0.5	132.30	44.10	145.55	48.50	220.50	77.20
0.75	992.25	330.75	1091.50	363.85	1113.50	374.85
1	1653.75	551.25	1819.15	6.6.40	2083.75	694.60
1.5	4410.00	1466.35	4851.00	1692.95	5832.25	1929.40
2	7276.50	2425.50	8004.15	2668.05	9790.20	3263.40
3	21609.00	7199.35	23769.90	7919.25	29172.15	9724.05
4	43218.00	14663.25	47539.80	16129.60	58344.30	19437.10

Source: Nepal Water Supply Corporation.

It has been well established that metered connection with progressive rate of water tariff economises the consumption of water. Previous studies conducted in Nepal suggest for changing non-metered connections into metered connections, but the recent study of SILT and DRTC (1997) recommends for abolition of meter in 0.5 inch connections. The avereage bil per month as estimated by SILT and DRTC (1997) is NRs 96.99 for the metered connections and NRs 120.00 for non-metered connections. Based on this, it points out the following advantages of the recommended abolition of the meters in half inch connections:

- Monthly revenue of NWSC will be increased which will help to improve the financial position of NWSC;
- The investment of NWSC on meters will be reduced;

- There will be less hassle to the consumers in terms of meter reading, non-performance of meters, etc. and there will be no objections from the consumers;
- The cost of meter reading will be be reduced which will also help to reduce the total cost of the NWSC.

Because of the intermittent water supply in Kathmandu, meters do not function properly. In the short term, metering all the connections is not justifiable. However, once enough water is available to provide 24-hour water supply, metering of 100 percent connections will be justifiable to promote more rational use o water.

Urban Water Supply Levels

The level of water supply services in the towns and cities of Nepal is generally inadequate and deteriorating due to rapid urbanisation. In most of the municipalities, the supply is intermittent. However, the level of service varies among the municipalities. The designed consumption rates for the 19 municipalities under the jurisdiction of DWSS in 1991 were 150 litres per capita per day, lcd, or fully plumbed connections, 65 lcd or yard taps and 45 lcd for public stand posts, whereas those for the 14 larger towns under the jurisdiction of NWSC were 180 lcd, 120 lcd, for partially plumbed connections, and 45 lcd respectively. The actual per capita consumption in the cities of Nepal has not yet been studied comprehensively (HMG/N, MHPP, DWSS (1991). Binnie and Partners (1990) computed water demand based on the standard consumption rate of 145 lcd for fully plumbed connections, 92 lcd for yard tap connections, and 45 lcd for public tap users.

Research has shown that 30-40 lcd of readily available water, if accompanied by adequate waste disposal facilities and sound hygienic practices, are suficient to attain the main health benefits of water use. Consumers, therefore, should be given an incentive to consume 40 lcd of safe water if they are not willing or able to do so at their prevailing income and marginal cosst price (Kalbermatten et al. 1982).

According to Population Census 1991, the average household size in Kathmandu, Bhaktapur and Lalitpur are 5.19, 6.68 and 5.62 respectively. The basic allowance for water is 8 M3 in Kathmandu valley for half inch connections. Thus, per capita daily water consumption for 8 M3 of household supply comes to about 51 litres in Kathmandu, 40 litres in Bhaktapur and 47 litres in Lalitpur. In view of the 40 litres water required for maintaining health, the provision of basic allowance by NWSC seems reasonable.

The existing water supply in NWSC service area is not equitable, however. Some consumers in low-lying areas and near transmission mains enjoy 24 hour supply, whereas most of the consumers receive only a few hours supply in a day. Consumer survey reported that only about 34

percent of the total 78,546 connections have either good or sufficient water flow. In view of the rapid growth of population and high rate on in-migration in Kathmandu valley, the existing water systems are not able to fulfil the growing demand for water there. Because of the shortage of water, the users of Kathmandu are ready to pay a higher price of water.

AFFORDABILITY OF WATER SERVICES IN KATHMANDU VALLEY

Levels, Sources and Distribution of Income

The income and income distribution based basically on Nepal Living Standard Survey (NLSS) 1996 of CBS can be cited to find out what proportion of the household budget householders have to pay if water is priced at its average incremental cost (AIC).

The definition of income used in NLSS was intended to capture the flow of resources which enable a household to achieve its living standard. The 12 months prior to the interview were taken as the relevant accounting period. The main components of income were: cultivation income, non-crop farm income, income from wage employment, non-farm family enterprise and self-employment income, income from transfers, rental income, and income from other sources. The total sample size in NLSS was 3,388 households, and out of them information were collected only from 3,373 households. The analysis of income level of households for the whole Nepal is based on 3,345 households as there were 28 outliers, and for Kathmandu valley is based on 345 observations as there were 11 outliers.

According to the NLSS 1996, average annual household income for the whole Nepal was NRs 43,732, whereas per capita income was NRs 7,690. Income varies between geographical regions and areas. It was found much higher in urban areas than in rural areas. In particular, average urban per capita income is more than twice the average rural per capita income. Again, among urban areas, the average per capita incomem of urban Kathmadu valley was more than three times the average per capita for Nepal. As to the distribution of income, in nominal terms the bottom 80 percent of the households earn 50 percent of total income, while the top 20 percent earn the other 50 percent of income (Table 5).

Table 5
Nominal Per Capita Income By Quintile In Nepal

Quintile	Mean Income	Quintile Share Percentage	Cumulative Share Percentage
I	2,020	5.3	5.3
II	3,848	10.0	15.3
III	5,399	14.0	29.3
IV	7,856	20.4	49.7
V	19,325	50.3	100.0
Average	7,690	-	-

Source: Computed by the Author based on NLSS 1996.

Table 6 reports nominal per capita income in current rupees and the share and cumulative share by quintile in Kathmandu valley. In nominal terms, the bottom 80 percent of households earn about 55.26 percent of total income, whereas the top 20 percent of household earn the other 44.74 percent of income. This indicates that income inequality for Kathmandu valley is higher than that for the whole Nepal.

Table 6
Nominal Per Capita Income By Quintile In Urban Kathmandu Valley

Quintile	Mean Income (NRs)	Quintile Share Percentage	Cumulative Share Percentage
I	7336	5.75	5.75
II	14306	11.20	16.95
III	20003	15.67	32.62
IV	28908	22.64	55.26
V	57116	44.74	100.00

Note : This table reports unweighted income figures, and is based on only 385 observations since 11 outliers were excluded.
Source: As of the Table 5.

Poverty Situation in Kathmandu Valley

The Eight Five Year Plan 1992-97 of the country has estimated 49 percent of the total population of Nepal living in poverty. Bastola (1997) estimates the incidence of poverty based on the NLSS 1996 data, and infers that the incidence, the depth, and the severity of poverty are all far

lower in the urban areas compared with rural areas of the country. He mentions that the incidence of poverty for the urban area as a whole is 23 percent, whereas it is only 4 percent in the urban part of the Kathmandu valley. The corresponding figure for rural area is 44 percent

Table 7
Poverty Measures By Urban ad RuralAreas 1995-96

Particulars	Urban			Rural
Head Count	0.04	0.34	0.23	0.44
Poverty Gap	0.004	0.11	0.07	0.13

Note: 396 households were sampled from the three municipalities (towns) of the Kathmandu valley in Nepal Living Standard Survey, 1996. Of them 11 observations (households) were excluded because of their reported income was either too low or too high. Therefore, Table 7 is based on only 385 observations. Moreover, the analysis is done without using weights.

Source: Bastola (1997).

Average Incremental Cost of Water Supply and Its Share in the Householder's Monthly Income

Ideally pricing of drinking water is to be based on the marginal cost pricing. Tiwari (1997) mentions that marginal cost consists of marginal construction cost, marginal user's cost and marginal environmental cost. Since in practice it is very much dificult to calculate marginal cost as water supply inverstments are often lumpy and information of marginal user's cost and marginal environmental cost are often not available, he estimates marginal construction cost, average incremental cost, (AIC) dividing the incremental cost by the incremental water supply from the national level data on total investment in water supply sector and additional water supply provided each year during the period 1980-1994. Using stepwise marginal construction cost method, he roughly estimates AIC of water supply in the whole Nepal NRs 50/cubic meter (US$ 0.9/cubic meter) at 1996 price. He mentions that the AIC in other countries is estimated at the range of US$ 0.82 (in the Mexico city) to US$ 1.5/cubic meter, in Amman, Jordan, and US$ 0.44/cubic meter, in Shanghai, China at 1988 price. Based on this cost, he mentions that assuming water supply at 45 lcd and family size of six, the marginal cost pricing per household would be NRs 410/household/month which is about 12 percent of the average monthly household income of the people of the rural areas of Lumbini Zone, Nepal where the FINNIDA drinking water project has been implemented.

SMEC (1992) has estimated incremental cost NRs 38 per M3 at 1992 price for the Melamchi scheme. Using GDP deflator, this comes to more than NRs 50 per M3 at 1996 price. The same study has mentioned that the

incremental cost is on the order of NRs 2-3/M3 in those parts of terai where there are readily accessible sources of ground water. Thus, there is significant difference in the water cost between Kathmandu and other parts of the country.

According to the population census 1991, the average household size of the three municipalities of Kathmandu valley is 5.39 which is significantly higher than the NLSS estimate, 4.9 persons. According to NLSS 1996, the average monthly household income in Kathmandu valley is NRs 9,911.6. At 5.39 household size and 40 lcd of water and 50 AIC per M3 water, the marginal coast pricing per household shoued be NRs 328 per month which is 3.3 percent of the average monthly household income of Kathmandu valley. Given the above parameters, at the 50 lcd of water the marginal cost pricing per household would be equal to NRs 410 which is about 4.1 percent of the average monthly household income of the Kathmandu valley. Based on the experience of willingness to pay conducted in the other countries, it seems that the residential users of Kathmandu valley feel comfortable to pay such a moderate proportion of their income for the water supply if good quality of water is provided and regular supply of water is ensured. However, in view of the inequality in the distribution of income in Kathmandu valley, the proportion of income to be paid for water services at the above rates would be significantly different for the rich and the poor households.

Water Consumption and Consumer Bills

The average per capita consumption of water per day in the urban Kathmandu valley is 70 litres, with slight variation across the three towns of the valley (SILT and DRTC 1997). This indicates that consumers of Kathmadu valley consume water above the current provision of basic alowance of 8 M3 by NWSC, and that they are paying above the minimum charge fixed for the basic allowance.

The average monthly billing per consumer varies with the connection size for metered and non-metered connections. The average monthly bill per household for half inch metered connection is NRs 97.0, and NRs 120.0 for non-metered connections. The water users at times feel hassles to pay the water bills and domestic users prefer non-metered connection. This indicates that users are willing to pay higher amount if there is improved provision on water service.

Table 8
Average Monthly Consumption Of Water In The Three Municipalities Of Kathmandu Valley

Municipality	Average HH Consumption/Month	Per Capita/Month	Per Capita/day
Kathmandu	20520	2096	70
Lalitpur	18355	2037	68
Bhaktapur	16909	2015	67
Urban Kathmandu Valley	19993	2096	70

Source: SILT and DRTC (1997).

Table 9
Average Monthly Water Bill For Users

Connection Size (Inch)	Metered (NRs)	Non-Metered (NRs)
0.5	96.99	120.00
0.75	838.44	900.00
1.0	1278.43	1500.00
1.5	6477.24	4000.00
2.0	8590.06	6600.00
3.0	51927.77	19600.00
4.0	38304.75	39200.00

Source: SILT and DRTC (1997).

The current monthly water bill of NRs 97.0 for metered connection accounts 1.0 percent, whereas the monthly water bill of NRs of 120.0 for non-metered connection is 1.2 percent of the average monthly household income in the urban Kathmandu valley.

The Consumer Survey estimates average monthly household consumption of water at 20 M3 in Kathmandu Valley (Table 8). When this consumption is priced at NRs 50 per M3, the cost per household would be NRs 1,00 which is about 10 percent of their monthly household income, which seems to be a higher burden for the consumers. This suggests a decrease either in the volume of household consumption of water or in the AIC of water to be supplied in the near future.

REVIEW OF LITERATURE ON WILLINGNESS TO PAY FOR DRINKING WATER

Introduction

Among others, one of the reasons for the low tariff rates for the urban water supply in Nepal is the government presumption that the ability to pay of the people is low and consequently their willingness to pay is also low. In view of the very low level of tariff set in the past, the tariff would have to be increased substantially to recover full cost in Kathmndu valley. There is apprehension that substantially increasing tariffs to cover full cost would lead to civil unrest. There is a need for evaluating the people's willingness to pay and their ability to pay. This section reviews some of the studies on willingnees to pay inside the country and outside the country, especialaly in the developing countries

Willingness to Pay (WTP) fo Water Supplies

The economics of water utility management in a industrial country is relatively simple. All potential users will connect to system, and all will have multiple taps in their yards and houses. Since the quantity of water is relatively inelastic with respect to its price in the industrial countries, future needs and revenue for a given tariff can be projected there with some confidence. But in a developing country the situation is more complicated. The number of potential users who will choose to connect to a system is heavily dependent on exogenous factors such as family's socio-economic situation, and the cost and the perceived quality of their existing sources, including accessibility, reliability, and aesthetic characteristics, as well as on factors controlled by the utility such as the level of services offered, the connection cost and the tariff charged (Briscoe et al. 1990).

The responsiveness of demand for water to price is well established. Elasticities of -0.2 to-0.7 are common and somewhat higher elasticities for industrial production even in the short term. A GTZ supported study in Bhaktapur, Nepal found that despite the very low tariffs non-metered households consume 77 percent more water than metered households, implying an elasticity of -0.28. Similar results were implied by the Kathmandu Leak Detection and Repair Study (WB 1993).

Compared to developed countries, there are very few studies on willingness to pay for improved water services in developing countries, and most of such studies are focused on rural communities.

Review of WTP studies in Developing Countries

A review of World Bank financed projects showed that the effective price charged for water is only about 35 percent of the average cost of supplying it. The proportion of total project financing generated by utilities

points in the same direction: internal cash generation accounts for only 8 percent of project costs in Asia, 9 percent in Sub-Saharan Africa, 21 percent in Latin America and the Caribbean, and 35 percent in the Middle East and North Africa (World Bank 1992a).

In 1987 the World Bank initiated a multi-country study of willingness to pay for water in rural areas with the objective of assessing whether the contingent valuation method was reliable for assessing demand for public goods in developing countries. The empirical studies were designed to assess how the proportion of families using a new system was affected by characteristics of the family and of the old and new water supply systems. The study was also designed to suggest what might constitute an appropriate water supply system both techincally and financially in diferent environmental and socio-economic settings. The studies were carried out jointly by a World Bank team and collaborating institutions in Brazil, India, Nigeria, Pakistan, Tanzania and Zimbabwe. The study suggests that where water demand is concerned, there are four broad categories of rural community (WB 1992a).

Type I: Willingness to pay for private connection is high and willingness to pay for public water point is low. This category probably includes many communities in Southeast Asia, South Asia, Latin America, and the Middle East and North America.

Type II: Only a minority of households are willing to pay the full cost of private connectiions, but most households are willing to pay the full cost of public water points. Many of the better-off communities in Sub-Saharan Africa and poorer communities in Asia and Latin America prbably fall into this category.

Type III: Households' willingness to pay for improved service is high but not high enough to pay the full cost of an improved service. This group typically includes poor communities in arid areas in South Asia and Sub-Saharan Africa. As in type two communities, people are willing to pay a relatively large share of their income for improved water service. The distinction is that the costs of supply are so high, as a result of a combination of aridity and low population densities, that improved system will not be built and operated without subsidies.

Type IV: Willingness to pay for any kind of improved service is low. This group typically includes poor communities in which i) traditional water supplies are considered more or less satisfactory by the population or ii) water supply is seen as the financial responsibility of the government. In such communities, self-findanced improved water supplies are not feasible.

Based on this World Bank multi-country study, it has been inferred that the willingness to pay varies significantly from one part to another in the developing world. In the rural communities in Zimbabwe, protected wells were perceived as being little more than a marginal improvement over the traditional open wells, and given the many alternative uses of their money, on the average families indicated that they would pay less than 0.5 percent of their income for the improvements (Robinson 1988). On the other hand, in rural communities in the Indian state of Kerala, the existing level of service, public taps, was much too low and many families were prepared to pay high tariffs or a reliable yard tap supply (Singh and Ramasubban 1989).

One of the World Bank multi-country studies was conducted by Briscoe et al. (1990) in Brazil using contingent valuation approach. This approach involves asking people either directly what they are willing to pay, or less directly what their choice would be if they were faced with certain prices for the service in question. The study addresses three questios: i) Are people's responses to willingness to pay questions believable ?, ii) How much are people willing to pay for water ? and iii) Is it possible to raise tariffs and increase revenues while protecting the poor ?

Three different areas of Brazil were surveyed: one in the interior of the relatively prosperous, well watered southern state of Parana; and two in poor, dry areas of the Northeast. The study design called for identifying areas where improved services were available but where not all families had chosen to connect, and others where improved services were not yet available. From the survey the probabilities that household would connect was estimated. The results were consistent with predictiions. The higher the price and the greater the distance to the source, the less likely was connection. WTP estimates were also obtained from questionnaires. The results provide not only an estimate of the average WTP, but also indicate how households would respond to higher prices, an important consideration if raising revenue is a concern. Maximum WTP for a yard tap was around 2.5 times the prevailing tariffs and some 2.3 percent of the family income. Some strategic bias in terms of under reporting WTP was probably present so that the true WTP was probably higher than this. Equity considerations could be taken care of by providing relatively highly priced services to the better off and using revenues to cross-subsidise the needs of poor for free public taps.

The study shows that surveys of actual and hypothetical water use practices can provide policy relevant information of willingness to pay, and that WTP varies according to household socio-economic characteristics and the characteristics of the existing and new supplies of water. The study showed that tariffs for yard taps could be increased substantially before significant numbers of households would choose not to connect to an improved system, whereas provision of free water at public

taps can protect the poor without jeopardising the financial viability of the scheme.

Mu et al. (1989) conducted a WTP study taking into account three sources of water supply in Ukunda, Kenya. The three sources of water supply are: i) water from vendors who visit the house; ii) water sold at kiosks in the village; and iii) water from well. The three sources found to vary in terms of the two indicators: time saving/collection time and expenditure. In terms of collection time, house delivery takes the least amount of time, whereas the collection from wells takes highest amount of time. In terms of expenditure, household vending costs the most, then kiosk water, with well water being the cheapest. By looking at actual choices, the trade off between money and time can be determined. Time saving is one of the benefits of water supply improvement. In this case if water quality is invariant between sources, time saving will generally define total benefits. The study found that users of vendors and kiosks were revealing high WTP for time saving, of the order of 8 percent of incomes (cited from Pearce 1993).

In the summer of 1986, staff of the African Medical Research Foundation carried out interviews with 69 randomly selected households in a part of Southeastern Ukunda, Kenya where households have access to several nearby water sources. Based on this interview, value of time spent collecting water was estimated. It has been found that the estimate of the average value of time was surprisingly close to the current market wage for unskilled labour, US$ 0.25 per hour. The result indicates that households in this village place a high value on the time they spend collecting water. This suggests that the economic benefits of improved water services in developing countries may be much greater than is commonly realised (Whittington et al. 1990).

Review of Willingness to Pay in Nepal

No studies on willingnes to pay have been conducted in Nepal using contingent valuation method, except the one recently conducted for FINNIDA supported rural water supply project covering some districts of Lumbini Zone of Nepal. Some of the studies provide more crude estimates of consumers' willingness to pay or water services. The effort is directed here to review these studies shich could at least give some thoughts for the preparation of a proper institutional arrangement for water, and designing water tariff structure.

In 1996, Tiwari (1997) conducted a sample survey of 502 households of four districts of Lumbini Zone, Nepal where the FINNIDA supported Rural Water Supply and Sanitation Project is under implementation. The objective was to determine water user's willingness to pay and thereby design alternative implementatin strategies. Some of the sample households were already beneficiaries of the project, whereas others were future beneficiaries of the project. A contingent valuation method was used in

oder to determine the willingness to pay for water service. Based on the survey results, he concludes that willingness to pay was higher than the per unit operation and maintenance cost in all except in one community, *Deurali*. But he points out that government may have to continue subsidising all the construction cost not initially borne by the users or the new schemes if the existing government policy for the project is to be followed.

A consumer survey within the NWSC service areas of the three cities of the Kathmandu valley, viz, Kathmandu, Lalitpur and Bhaktapur and their adjacent settlements along the transmission and distribution mains covering an area of 100 meters on the either side of the water mains was conducted in 1996 jointly by SILT Consultants and Development Research and Training Centre. The survey was to establish reliable computerised database so as to enable NWSC management to make informed policy and management decisions and enhance more eficient revenue collection. Apart from preparing a database for the water consumers, a case study of 60 sample consumers was also conducted in order to find information of the behavioural aspects of the consumers. This case study revealed that the water-use habits of the consumers varied depending upon the availability of water. It found that in some areas consumers are paying their water bills although water is not flowing in their taps, with the hope that in the future suficient water will flow in their taps, and that they are willing to pay higher price if water supply is improved. Although the study did not estimate how much consumers are willing to pay for improved water services in the three towns of the Kathmandu valley, the findings that consumers would be willing to pay a higher tariff if they were porvided reliable supply of good quality water.

MULTI Disciplinary and New ERA (1995) conducted a study for the water supply system of Bharatpur municipality and concluded that the people of the municipality are both willing and able to pay higher tariffs than currently charged. MULTI Disciplinary (1992) summarises findings on willingness to pay for water from the studies that it conducted jointly with Binnie et al. (1998) in the past. It points that Nepalese consumers would be willing to pay higher tariffs for an improved service, and that they spend less on water, 1 percent of household income, than consumers in other similar countries in the South Asian region. Based on its previous studies, it also mentions that in the region, expenditure on water of 3 to 7 percent of household income is considered reasonalble.

MULTI Disciplinary Consultants and Interdisciplinary Analysts (1990) carried out a sample survey of 28 households from the prospective consumers of Dhulikhel water supply system of four wards of Dhulikhel municipality. The survey includes question regarding the economic capacity of potential consumers, their current water use practices, and their ability and willingness to pay for water to be supplied by the project. The survey

was conducted in 1989. When asked if drinking water should be provided free, 29 percent of the respondents responded that it should be provided free while 71 percent felt that it should not be provided free. Those who felt that water should not be provided free expressed their willingness to pay ranging form NRs 7 to NRs 40, with an average of NRs 19.75 per month as water tariff. At this time the consumers of Kathmandu were paying NRs 7 as the monthly charge for water.

CONCLUSION

The importance of safe and potable water has been sufficiently underlined in the recent literature. The adverse consequences of lack of safe water on productivity, health and quality of life are obvious. Therefore, HMGN made efforts to provide safe water, with increased emphasis since the inauguration of the United Nations' International Drinking Water and Sanitation Decade in 1981. In spite of repeated emphasis on the provision of drinking water by the HMGN, the coverage of drinking water is only about 61 percent of th total population of the country, and the level of service is also poor.

Among others, one of the main reasons for the low coverage of water in the country is inefficient operation of the public utilities engaged in the provision of drinking water. The Eight Five Year Plan (1992-97) recognised this fact and pointed that the shortfall arised less from inadequate investment than from deficiency in the sector institutions. With the repeated emphasis by the donors to privatise the public utilities and/or make them autonomous, the HMG/N has changed in its approach in the provision of drinking water.

Rapid urbanisation of Kathmandu valley creates huge demand for water services together with the other infrastructure services. Because of the lack of resources with the government, majority of the funds has to come from the urban residents of the valley themselves in order to make sustainable provision of drinking water.

Living conditions in core parts of the urban Kathmandu valley is very crowded. Although the average household size is about 5.4 persons in the valley, the number of persons living in a house is about 9 because about a quarter of the houses are rented out to others. This puts further pressure on the infrastructure services including drinking water in Kathmandu valley.

In the urban areas of Kathmandu valley, about 93 percent of the households have access to piped water supply and nearly 80 percent have private connections. Access to piped water supply varies across the three towns of the Kathmandu valley, better in Bhaktapur but poor in Kathmandu. But in Bhaktapur, the proportion of households with private connections is lowest of the three towns of the valley. However, majority of the residents of the Kathmandu valley are unsatisfied with the current service of water.

According to NLSS, 1996 the annual average household income is NRs 118,939 and the per capita income is NRs 24,084 in urban Kathmandu valley which is significantly higher than any other parts of the country. Compared to whole Nepal, although the inequality in the distribution of income is higher in urban Kathmandu valley, the incidence of poverty is very low there.

At present the users of Kathmandu valley are paying in the range of NRs 97 to120 which is about 1 percent of their average montly household income. In addition, many households invest in water tanks and pumps or spend considerable time each day collecting water from public taps and other sources. Few hoseholds also buy water from NWSC water tanks at a substantially high price during dry season. There appears to be considerable scope for increasing tariffs if the quality of service improves.

The review of willingness to pay for water conducted in different countries including Nepal suggests that users are willing to pay higher for the improved provision of water. In case of Kathmandu valley, however, there is dearth of literature on the willingess to pay of the users. Whatever studies have been conducted in this aspect in the past give an indication of higher willingness to pay rather than a quantitative estimate of willingness to pay. In view of this, there is a need for conducting a willingness to pay study for the water users of the Kathmandu valley.

The long-rooted belief among the Nepalese communities including those of Kathmandu valley, that the provision of water is the responsibility of the government, suggests that there is a need for investigating into their attitude about the participation of private contractor in the provision of drinking water.

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